Claims

1. Cup-shaped hydraulic piston (10) made from rolled sheet metal, comprising
- an open end (12),
- a side wall (16) with a cylindrical outer surface (18) and an inner surface (22), wherein the side wall (16) at its outer surface (18) is provided with an annular groove (20) in a portion adjoining the open end (12), and
- a piston head (14),
wherein a portion (24) of the inner surface (22) of the side wall (16) adjoining the open end (12) and extending in axial direction over the annular groove (20) has a cylindrical shape, and wherein the thickness of the side wall (16) decreases monotonically from the portion (24) of the inner surface (22) up the piston head (14).

2. Hydraulic piston according to claim 1, characterized in that the piston head (14) is curved inwards.

3. Hydraulic piston according to claim 2, characterized in that the piston head (14) is curved in a concave manner.

4. Hydraulic piston according to claim 2, characterized in that the radially outer part of the piston head (14) has the shape of a truncated cone and the central part of the piston head (14) has the shape of a spherical cap.

5. Hydraulic piston according to claim 4, characterized in that the extension of the truncated-

cone-shaped part of the piston head (14) along its profile is not greater than three times the wall thickness of the side wall (16) in its portion adjoining the piston head (14).

6. Method of manufacturing a hydraulic piston according to one of the preceding claims, comprising the steps:
- punching a disk-shaped round blank out of a piece of rolled sheet metal,
- deep-drawing the disk-shaped round blank into a cup shape by means of a bottom die and a punch,
- stamping the cup-shaped blank to form the piston head and the cylindrical outer surface of the hydraulic piston, and
- incorporating an annular groove into the outer surface of the hydraulic piston.

7. Method according to claim 6,
characterized in that the disk-shaped round blank during deep-drawing into a cup shape is pressed firstly by means of a first punch through a first circular die opening and then by means of a second punch through a second circular die opening, the diameter of which is smaller than the diameter of the first die opening.

8. Method according to claim 7,
characterized in that the first punch and the second punch are cylindrical.

9. Method according to claim 7 or 8,
characterized in that the cup-shaped blank is pressed by means of a third punch through a third circular die opening, the diameter of which is smaller than the diameter of the second die opening, wherein the third punch has a first cylindrical portion emanating from

its free end and adjoined by a second cylindrical portion, the diameter of which is greater than the diameter of the first cylindrical portion and smaller than the diameter of the third die opening, in order to form a step in the side wall at the open end of the blank.

10. Method according to claim 9, characterized in that subsequent to deep-drawing into a cup shape a first stamping operation is effected to form an inwardly curved piston head in that a step-shaped punch comes into engagement with the step in the side wall of the blank and presses the blank into a bottom forming die.

11. Method according to claim 10, characterized in that subsequent to the first stamping operation the cup-shaped blank is pressed by means of a step-shaped punch, which comes into engagement with the step in the side wall of the blank, through a fourth circular die opening, the diameter of which is smaller than the diameter of the third die opening, in order to form the cylindrical outer surface of the side wall.

12. Method according to claim 11, characterized in that subsequent to forming of the cylindrical outer surface of the side wall a second stamping operation is effected by means of a bottom forming die and a step-shaped punch, which comes into engagement with the step in the side wall of the blank, in order to form a transition region between the piston head and the side wall.

13. Method according to claim 12, characterized in that the region of the bottom die touching the piston head is cap-shaped in the centre and truncated-cone-shaped at the edge.

14. Method according to claim 12 or 13, characterized in that subsequent to forming of the transition region between the piston head and the side wall a third stamping operation is effected by means of a bottom forming die and a step-shaped punch, which comes into engagement with the step in the side wall of the blank, in order to form the final configuration of the piston head.

15. Method according to one of claims 6 to 14, characterized in that subsequent to forming of the annular groove at least the outer surface is subsequently machined, wherein the subsequent machining comprises at least one of the following steps:
- grinding;
- coating, and
- polishing.

16. Intermediate product in the manufacture of a cup-shaped hydraulic piston according to one of claims 1 to 5, wherein the intermediate product is manufactured by means of the following steps:
- punching a disk-shaped round blank out of a piece of rolled sheet metal,
- deep-drawing the disk-shaped round blank into a cup shape by means of a bottom die and a punch, and
- stamping the cup-shaped blank to form the piston head and the cylindrical outer surface of the hydraulic piston.